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www.oircjournals.orgISSN: 2523-9430 (**Online Publication**)
ISSN: 2523-9422 (**Print Publication**)**Evaluating the Integration Process of Green Practices in Upgrading of Informal Settlements in Medium Sized Towns in Kenya**Elizabeth Murey¹

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ARTICLE INFO**Article History:**Received 17th February, 2018Received in Revised Form 28th February, 2018Accepted 07th March, 2018Published online 07th March, 2018**Keywords:** *Green practices, Informal settlements, Medium Sized, Sustainability, Kenya***ABSTRACT**

Informal settlements in developing countries have been growing and so has been the need to better their interventions. The international development community and governments have been actively working to improve living conditions of informal settlement dwellers through adaptive and proactive measures implemented through a variety of upgrading initiatives. However, there has been limited study on evaluation of integration process of green practices interventions that ensure improved human well-being and efficient utilization of resources while significantly

reducing environmental risks. This study evaluates the integration process of green practices in water, energy and waste sectors in upgrading of informal settlements in three informal settlements namely: Munyaka, Kamukunji and Huruma in Eldoret town, Uasin Gishu County, Kenya. Developing a view of ascertaining what was involved in the upgrading, how it was done as well identification of various stakeholders involved in upgrading process. The study was anchored on Triple Bottom Line Model of sustainability. The findings of the study established that there are various activities involved in integration process which included street and security lighting, footpath and bike path and storm water drainage. The study also established that various stakeholders were involved in the upgrading process and that there was low informal settlement dwellers participation. The study recommends that to be effective and to fully integrate green practices all stakeholders should be involved and instead of wholly depending on development actors the informal settlements residents should also embrace green practices at individual level.

Introduction and Background Information.

In the recent past there has been increasing global attention on the need to tackle the emergence and growth of informal settlements across the world's cities. Third United Nations (UN) Conference in

Istanbul in June 1996, which gave birth to the Istanbul Declaration on Human Settlements, marked a significant turning point in the global policy discourse on the need to ensure adequate shelter for all. This policy agenda, was later

given attention within the framework of the UN Millennium Development Goals (MDGs), which provided under Goal 7 Target 11, to significantly improve the lives of over 100 million slum dwellers by the year 2020 (UN Habitat, 2003). More recently, the Sustainable Development Goals (SDGs) adopted by the UN General Assembly in September 2015, includes SDG number 11, which calls upon countries to make cities more inclusive, safe, resilient and sustainable. It is argued that adopting green practices is the path way to achieving Sustainable Development Goals. Further, Hadi (2015) opines that going green and adopting various environmental management techniques and green practices provides an alternative paradigm that offers the promise of development while protecting the earth's environment and in turn, contributing to poverty alleviation and addressing the challenges of urbanization especially in informal settlements. According to *Going Green Sustainable Resource Guide 2008 – 2015* green practices is defined as practices that can lead to more environmentally friendly and ecologically responsible decisions and lifestyles, which can help protect the environment and sustain its natural resources for current and future generations. It is also defined as the practices which are concerned with and supporting environmentalism and tending to preserve environmental quality while utilizing the resources (Green Times, 2013). This study adopted green practices to include strategies that were integrated in upgrading of informal settlement to ensure sustainability. For example, it was not about provision of housing, water and electricity in the informal settlement, but provision of more environmentally friendly and energy efficient housing connected to strategies of using renewable energy, using rain water harvesting and proper waste management (UN-HABITAT, 2012).

According to Hadi (2015) there are many dimensions of green practices which include: Green planning and design, green open space, green waste, green transportation, green water, green energy, green building and green

community. This study adopted; green energy, green water and green waste dimensions adopted in informal settlement upgrading.

The main terms associated with these green practices include green growth or green economy. As cited in Africa Development Report 2012, The Africa Development Bank defined green growth as “the promotion and maximization of opportunities from economic growth through building resilience, managing natural assets efficiently and sustainably, including enhancing agricultural productivity, and promoting sustainable infrastructure”. Green growth is closely related to the concept of a green economy, framed as: “An economy that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities”. United Nations Environment Programme (UNEP, 2011, OECD, 2011, UN-ESCAP et al., 2010).

On the other hand, Kibwana (2000) defined informal or spontaneous settlements as settlements whereby persons, or squatters, assert land rights or occupy for exploitation; land which is not registered in their names, or government land, or land legally owned by other individuals. In Kenya, there exists no official definition of informal settlements or slums, and these terms are used interchangeably (HABITAT, 2003). In this study, the term ‘informal settlement’ will be preferred to the term ‘slum’.

According to Cronin (2012), an informal settlement is a consolidated area of the city with limited access to urban services characterized by poor living conditions, spontaneous built environment and generally composed of a population with low socio-economic means. (United Nations Centre for Human Settlement, (UNCHS), 2002) defined informal settlement as a term used to describe a wide range of low-income settlements with poor human living conditions. The operational definition of a United Nations Expert Group is what was adopted for this study (UN-Habitat, 2007). It defined informal settlement as an area that combines to various extents, the following characteristics:

- Inadequate access to safe water;
- Inadequate access to sanitation and other infrastructure;
- Poor structural quality of housing;
- Overcrowding; and
- Insecure residential status

Thus, informal settlement in the present study refers to a settlement which has the above attributes and features.

Further, the upgrading of informal settlement on the other hand, consists of physical, social, economic, organizational and environmental improvements undertaken cooperatively and locally among citizens, community groups, businesses, and local authorities (Cities Alliance, 2012). Kessler (2000) opines that upgrading of informal settlement customarily provides a package of improvements in streets, footpaths and drainage, proper solid waste collection, street lights for security and electricity to homes. In addition, Acioly (2002) opines that the new aphorism in informal settlement upgrading is "integration" which includes physical integration, social integration and juridical integration. Physical integration is the transformation of the informal settlement settlements into neighbourhoods through direct public investments, opening of roads, connection to city's infrastructure networks and public services, merging to the city's cadastre and official maps. Social integration, meaning that specific programs addressing community needs, vocational training and social development are implemented vis-à-vis the public works. Juridical integration means the regularization of land parcelling and individual plot titling and final resolution of land ownership issues which complements city-wide cadastre needed to collect property taxes and user's taxes and tariffs. Currently, the paradigm shift is towards integration of green practices which is the pathways to attaining of Sustainable Development Goals. Green practices results in improved human wellbeing and social equity while significantly reducing environments risks and ecological scarcities. There is a need therefore

to explore how green practices have been integrated in the informal settlement upgrading in medium size towns in Kenya.

Statement of the Problem

The search for sustainable urban development framework for the provision of basic services and infrastructure in informal settlements has become a global agenda. This is augmented by global initiatives with international actors such as UN-HABITAT, World Bank and United Nations affiliated bodies working on sustainable development. In the past, development actors have dealt with such problems through funding of housing programmes such as introduction of site and service schemes, all geared towards increasing housing stock, improvement of physical housing conditions and infrastructure provision. This development paradigm however ignored the improvement of the household livelihood and minimization of environmental risk which are key pillars to sustainable urban development. In Kenya, response to the growth of informal settlements has been fragmented and uncoordinated, while at the same time expensive and unsustainable. There is need to come up with workable strategies that can address green practice adoption. Such initiatives will not only address the settlement challenges but also open up opportunities for employment and empowerment of urban dwellers and above all ensure environmental sustainability.

Theoretical Framework

Although there are various theories and models that have been advanced on the study of green practices this study is grounded on the Triple Bottom Line Model (TBL) advocated by business consultant John Elkington in 1990. The model describes economic, environmental, and social value of investment. The concept is sometimes referred to as the 3Ps (people, planet, profit). Triple bottom line thinking is informed by and relates to the concept of sustainable development on the premise that development should occur in ways that meet the needs of current generations while maintaining conditions and opportunities

for future generations to do the same (World Commission on Environment and Development, 1987).

From sustainable urban development perspective, the TBL approach encompasses a much bigger picture, and includes a broader focus on economic sustainability than the mere financial feasibility. On the broader sustainability platform, the Johannesburg Declaration on Sustainable Development (United Nations, 2002)

explains that the TBL sustainability has three mutually reinforcing pillars of sustainable development namely economic development, social development and environmental protection. At this point, sustainability is perceived as the position where these three pillars interact and created a common platform from which sustainable development can be attained or exercised to achieve common benefits. As shown in the figure below.

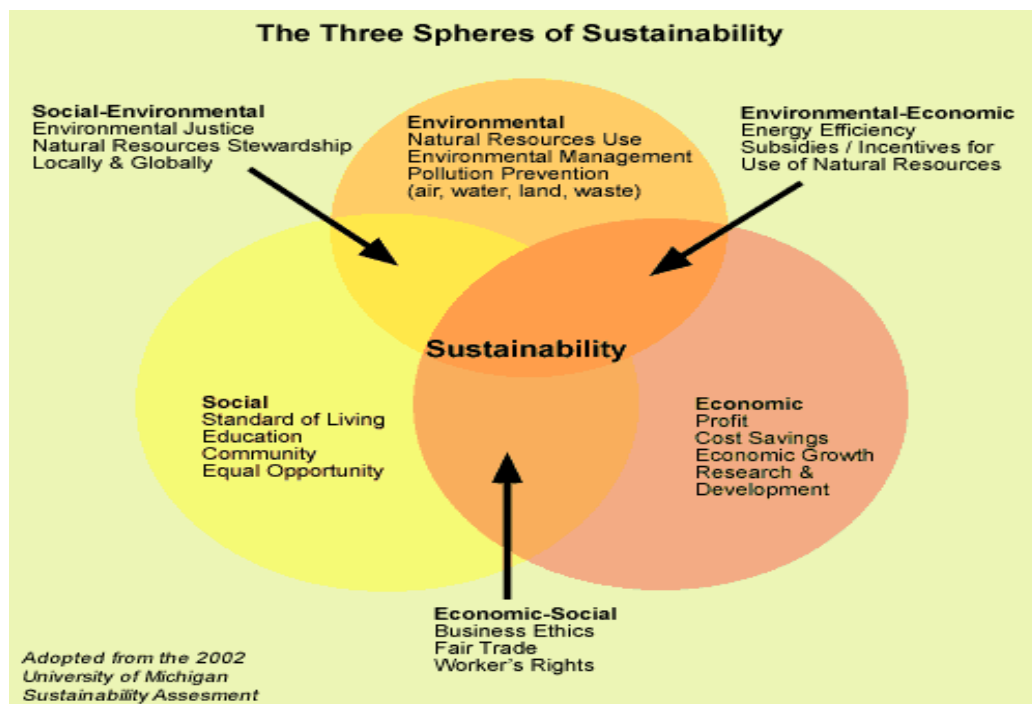


Figure 1:1 Three Pillars of Sustainability

There is a growing global awareness of the necessity for sustainable development to handle the looming environmental problems of global warming and climate change, emissions and resources depletion caused by human activities (SDN, 2009). This model is applicable in the study because upgrading processes are multi-sectorial operations that combine environmental, economic and social interventions. They match with the aim of sustainable urban development

of making healthy, economically urban communities that are socially just regarding their access to better services and the adequate urban environment. Upgrading also manages resource utilization by relying on structures and existing efforts.

Methodology

The study adopted the descriptive survey research design. This design was found

appropriate since it attempts to describe what is in a social setting such as an informal settlement. The target population of this study comprised mainly the 370 households' heads in the 3 informal settlements in Eldoret. In addition, the study also targeted key informants which included a representative from Ministry of Land, Housing, and Urban Development, one from NEMA, KISIP project component three managers, County Community Development Officer, County Director of Environment, County Director of Water, and County Physical Planner. The study employed simple random sampling to choose a household head (or his/her deputy when the head is absent) who was willing to fill the questionnaires, systematic to obtain the household and purposive sampling to select key informants and stakeholder's representative from Settlement Executive Committee SEC who were believed to be resourceful by virtue of possessing information crucial to the achievement of the study objectives.

Literature Review

Arguably one of the better ways of implementing the green practices in the informal settlements, is for service providers in water, energy and waste sectors to work with governments and development actors to further reduce the connection fee due to high initial cost after extending energy, water and sewer networks in informal settlements of this basic services to encourage people to connect legally to services rather than obtain them through cartels that connect illegally and charge more than formal service providers would. In addition they should provide payment alternatives that take into account income levels in informal settlements this will help reduce defaults and service interruptions. A good example is the mechanisms that are being piloted in the water and electricity sectors by Nairobi Water and Sewerage Company which launched a mobile phone platform that enables customers to report meter readings and to receive and settle bills. This allows customers to pay their bills when funds are available Kenya urbanization report

(2016). In addition the provision to each household in an informal settlement with a prepaid meter, by the Kenya Power is allowing them to control exactly how much they spending on electricity each month. The pay as you use solar system by Safaricom is also another initiative that is encouraging the communities to embrace green practices.

Integration of green practices requires creation of awareness for example based on the Case study on the adoption of energy efficient lighting in the Nairobi informal settlement of Kibera it was found out that an incandescent bulb may break five times monthly whereas a high quality energy saving bulbs can reach life spans of six to eight years, resulting in product cost savings as a result of enhanced durability. Further, a randomised control trial (RCT) conducted in Kibera showed the impact of simply informing people about this fact. The combination of a voucher for high quality bulbs with a salient information flyer increased the uptake rate of efficient lighting to 84% compared to 23% when only the voucher was provided. In addition, Supporting policy measures also need to be integrated to facilitate energy efficiency uptake. For example, in Kenya, substantial counterfeit CFL bulbs have reduced consumer confidence in these products, as the market is heavily populated with inferior products with higher amounts of mercury and low durability. The impact of these concerns on demand for efficient lighting was highlighted by the study mentioned above. It showed that respondents were very willing to buy a CFL bulb even at a relatively high price if they believed efforts had been made to secure a non-counterfeit, high quality product. Quality assurance infrastructure is thus an essential policy framework element that is required in integration of green energy to limit the needless erosion of market confidence in unfamiliar efficient technologies and build trust in energy efficient innovations. In tandem to quality

On the other hand, Integration of Green Waste in Informal Settlement Upgrading requires tapping into greening a number of informal activities that benefits the poor, including waste management

(through efforts to prioritise the 3Rs of Reduce, Recycle and Reuse. Apart from waste management integration process involves well laid down policies from disposal at household level, Transport of waste and management of land fill.

According to NEMA regulations on waste transportation include:

- The County Governments should provide adequate transport for the various segregated waste streams;
- The waste transportation trucks should be closed and suitable for the transportation of the various waste streams to the waste treatment facilities and landfills; as shown in figure 2.3 below.
- The trucks waste trucks should be regularly serviced and maintained to avoid littering of waste;
- All waste transportation vehicles should be licenced to operate by NEMA



Figure 1.2: A well designed waste transportation vehicle in use in Denmark

Source NEMA (2014)



Figure 1.3: The Kipkenyo dumpsite in Eldoret,

Source: NEMA (2014)



Figure 1.4: A well-managed sanitary landfill in the City of Dublin

Source: NEMA (2014)

On green water integration Mwangi *et al.*, (2015) Water and Sanitation Program report on innovation in scaling up access to water and sanitation services focused on the innovations that were developed and implemented to improve sustainable access to water and sanitation services for residents of urban low income areas. The innovations covered institutional level work under social connections policies a financing mechanism using commercial micro-finance and use of output-based subsidies from the Global Program on Output Based Aid (GPOBA) and Information Communication Technology (ICT) initiatives using a mobile phone based self-meter reading system locally known as Jisomee Mita. The social connection policy has now made it affordable for Kayole Soweto residents to access piped water

through formal connections from the network to communal residences.

Discussion of the Findings

Types of Upgrading Projects in the Settlement

Informal settlement upgrading may suggest many things, but at its simplest it has come to mean a package of basic services, i.e. clean water supply and adequate sewage disposal to improve the wellbeing of the community. This in turn customarily provides a package of improvements in streets, footpaths and drainage, proper solid waste collection, street lights for security and electricity to homes often initiated through various upgraded projects, Kessler (2000).

The findings indicated various types of upgrading projects in the settlements and as shown in Table below.

Table 1.1: Upgrading Projects

Upgrading Project	Frequency	Percentage
Street Security lighting	317	88.6%
Solid Waste Management	131	36.6%
Storm water drainage	218	60.9%
Water and Sanitation Systems	113	31.6%
Drinking water	121	33.8%
Solar installation	27	7.5%
Public parks and green space	45	12.6%
Footpath and bike path	223	62.3%
Vending Platforms	63	17.6%

Source: Researcher, 2017

Based on analysis of the different types of upgraded projects, it is shown that the most popular upgraded projects in the settlement were street and security lighting, footpath and bike path and storm water drainage with 317 (88.6%), 223 (62.3%) and 218 (60.9%) respondents respectively. Solid waste management and drinking water projects were ranked next at 131 (36.6%) and 121 (33.8%) respectively. The projects that were not very common were vending platforms, public parks and green space while the least popular was solar installation at 63 (17.6%), 45 (12.6%) and lastly 27 (7.5%) in that order.

Further, an interview with the KISIP component three manager carried revealed that. Environmental and social management was integrated into the development and operation of projects financed under KISIP to ensure effective mitigation of potentially adverse impacts while enhancing accruing benefits. In addition, Environmental and Social Impact Assessment program.

Main Stakeholders in Upgrading of Settlements

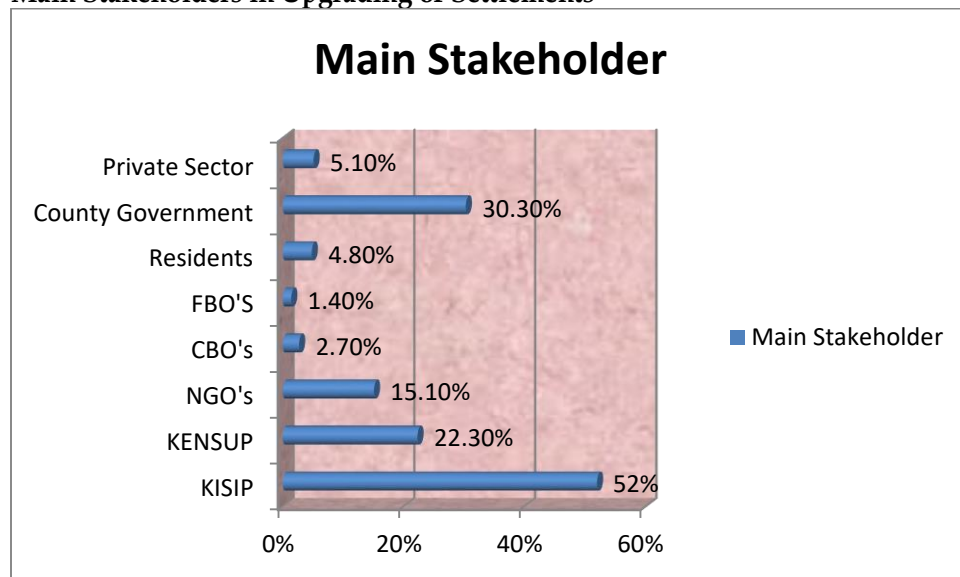


Figure 1.5: Main Stakeholders Involved in Upgrading Process

Source: Researcher, 2017

(ESIA) Report for the informal settlements in Eldoret Town identified adverse environmental and social impacts which could have been caused by the projects selected for implementation in these settlements and it developed, where required, suitable mitigation measures.

From the above it was clear that the main environmental mitigation measure that need to be taken during operation is an adequate maintenance of these systems. It is important to define exactly who in each case is responsible for maintenance and roles that citizens and government play as well.

Stakeholders Involved in Upgrading

Informal settlement upgrading process involves various improvements undertaken cooperatively and locally by various stakeholders such as citizens, community groups, business people, FBOs, NGOs, local authorities, and international community. The figure below shows stakeholders involved in upgrading

Findings in the current study show that various stakeholders are involved in the upgrading process in the three informal settlements. It was clearly evident that KISIP was identified as one of the main stakeholder having undertaken various initiatives in the IS upgrading with 186 (54.2%) respondents. The county government of Uasin Gishu was the next main stakeholder in which 108(30%) of respondents confirmed its involvement in the upgrading process. Thirdly, KENSUP had 80 (22.3%) responses, who said that it was involved in the upgrading process. Respondent said that other stakeholders were; NGO'S with 54 (15.1%), the private sector with 18 (5.1%), the residents with 17 (4.8%) and lastly CBOs and FBOs with 9 (2.5%) and 5 (1.4%) respectively.

It was also noted that the KISIP project was initiated in the year 2011 and was focused in investing in infrastructure and service delivery. They have invested in roads, bicycle paths, pedestrian walkways, street and security lights, waste management, water drainage, sanitation, green spaces, and platforms in the informal settlements.

Chege (2013) opines that local governments are involved in provision of basic public goods and services, shelter, social and physical infrastructure in the areas of their jurisdiction. In addition, Acioly (2007) argues that experience shows that informal settlement upgrading requires political will and firm commitment of local governments that can sustain long-term programs and implementation. KENSUP's involvement in upgrading process has been country-wide and have a long-term strategy (2005-2025), focusing on housing and other issues in the informal settlements. Indeed, Mgele (2013) confirms that the Government of Kenya has addressed shelter issues through various initiatives and sectorial interventions that include: provision of minimum services, extension of tenure security and physical upgrading, recognition of the legitimate role of low income settlers and other stakeholders in urban development, and the formulation of a comprehensive national slum upgrading

programme under the Kenya Slum Upgrading Programme (KENSUP) in the informal settlements.

Non-governmental organizations often play a valuable role in improving the quality of life in informal settlement around the globe. Bad policies, wasteful spending and corruption have prevented governments from providing adequate aid to informal settlements in many parts of the world. NGOs often attempt to fill the void, promoting development and delivering aid to slums. According to Wilburn (2008) local NGOs often have the knowledge and experience needed for practicing good governance. Development actors who lack this local knowledge are often willing to form partnerships with local NGOs in providing aid to informal settlements. NGOs can therefore serve as a link between informal settlements dwellers and development actors. However, these findings contradict with those of UN HABITAT (2003) who argue that civil society and NGOs are an important force to address several humanitarian problems and living conditions in informal settlement. They are however unable to make as much difference and progress as they should because they have to cope with political conflicts of the state and market (Un-Habitat, 2003).

Governments and the development community have invested significantly in improving the lives of IS dwellers through a range of upgrading programs which typically include infrastructure investments (water and sanitation, waste management, electricity, roads), and in some cases interventions aimed at improving tenure security, social infrastructure, housing quality, access to credit and access to social programs.

The immense and growing scale of IS has, however, outpaced the impact these programs alone can have. When considering the scaling up of such efforts to address the growing problem, it is perhaps doubtful that the public sector can do it alone and hence the need for alternative approaches. One such approach with enormous potential is the mobilization of additional private

sector finance and expertise. In addition, UN Habitat (2003) opines that the levels of poverty within an IS are critical to the strategies employed in involving the private sector. In addition, the state of the private sector itself is also critical. In many countries, the formal private sector is relatively small and may have limited capacity and even more limited resources, and is often highly risky averse, making it easier to focus investment opportunities with the wealthy.

Resident's involvement in informal settlements upgrading process in many ways acts as a 'poverty trap' since stigmatization, discrimination and geographic separation act to limit IS dwellers' access to formal job markets and credit. With good governance, the limiting effects of IS can be overcome, thereby halting the growth of IS by providing opportunities for IS

dwellers to improve their living standards (Otiso, 2003). In addition, the FGD revealed that many landlords in the IS lack the title deeds and this discourages them from undertaking any meaningful upgrading.

CBOs and FBOs generally have not been involved in upgrading physical projects but rather in intangible projects such as capacity building, advocacy and awareness creation which are of foremost importance.

Participation in Upgrading Process

It is important for the Informal Settlement dwellers to be involved in defining their own problems, setting priorities, and coming up with solutions that may help solve their problems. Respondents were asked if they had taken part in the upgrading process of their settlement. The table below shows the responses.

Table 1.2 Participation of Residents in Upgrading Process

Response	Frequency	Percentage (%)
Yes	115	32.2%
No	242	67.8%
Total	357	100%

Source: Researcher, 2017

These findings revealed that, only 115 (32.2%) took part in the upgrading process while a majority, 242 (67.8%) did not take part. Those who said took part were then asked state the level of participation they were involved in. The figure below shows the responses.

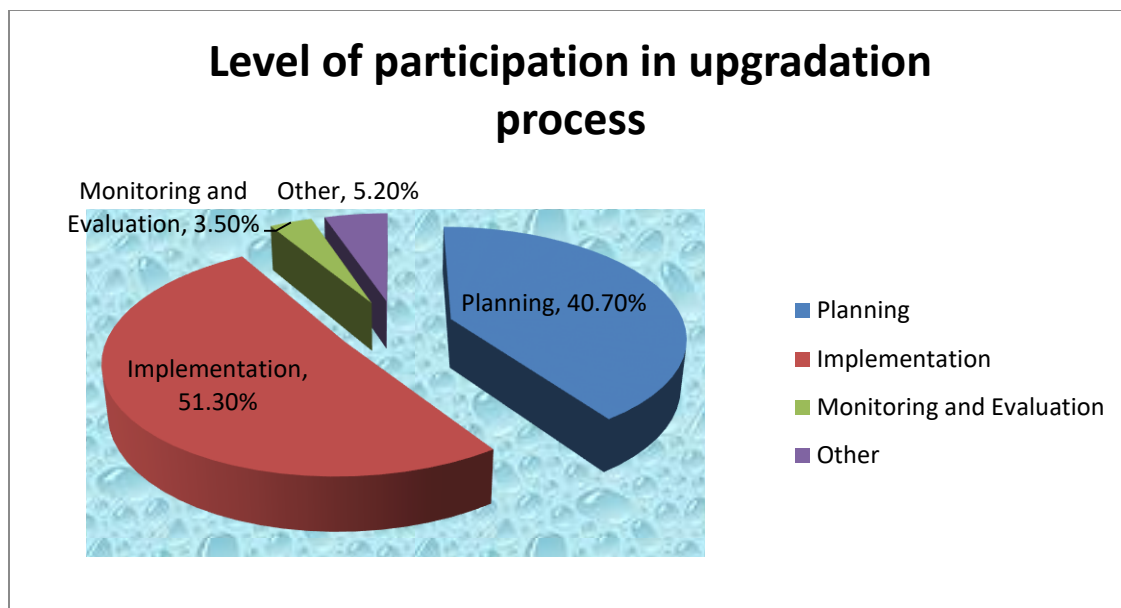


Figure 1.6 Level of Participation

Source: Researcher, 2017

From the figure, it was noted that 46 (40.7%) respondents were involved in the planning process, 59 (51.3%) in the implementation stage, 4 (3.5%) in monitoring and evaluation process and 6 (5.2%) were not sure of the level at which they were involved. It is worth to note that a relatively low percentage of IS dwellers (32.2%) were involved in the different levels of participation. Perhaps this may give an indication that the community is not well organized, empowered and sensitized from the beginning. Perten (2011) states that there are dissimilar stages of participation. These include; initiation, planning, design, implementation, and maintenance stages of participation. On the other hand, Lemma (2010) argues that community participation is an indispensable element in any informal settlement upgrading program and it is necessary to involve the community in the preparation of the regularization and upgrading plans and that without active co-operation, plans cannot be successfully implemented. He further argues that community participation facilitates ownership and sustainability. If the community is not fully engaged in key decision-making processes which occur in the conception and

planning stage, the success of the program is challenged (Lemma, 2010). On the contrary, Interviews with KISIP *Component Three* and community development officer confirmed that community members were invited to attend sensitization meetings on the proposed project but the attendance was not commendable. The interview further revealed that some were not involved because projects take long to be implemented after the baseline survey. They gave an example of KISIP projects whose process started in 2011 but was implemented in 2013. This two-year period lapse gives an impression that perhaps other IS residents could have moved to other estates and new entrants coming in altogether.

Various Activities Involved in the Upgraded Projects

IS upgrading involves various projects which requires various activities to be carried out as discussed below.

Drinking Water Projects in the Settlement

An adequate supply of safe drinking water is universally recognized as a basic human need.

Yet millions of people in the developing world do not have ready access to an adequate and safe water supply.

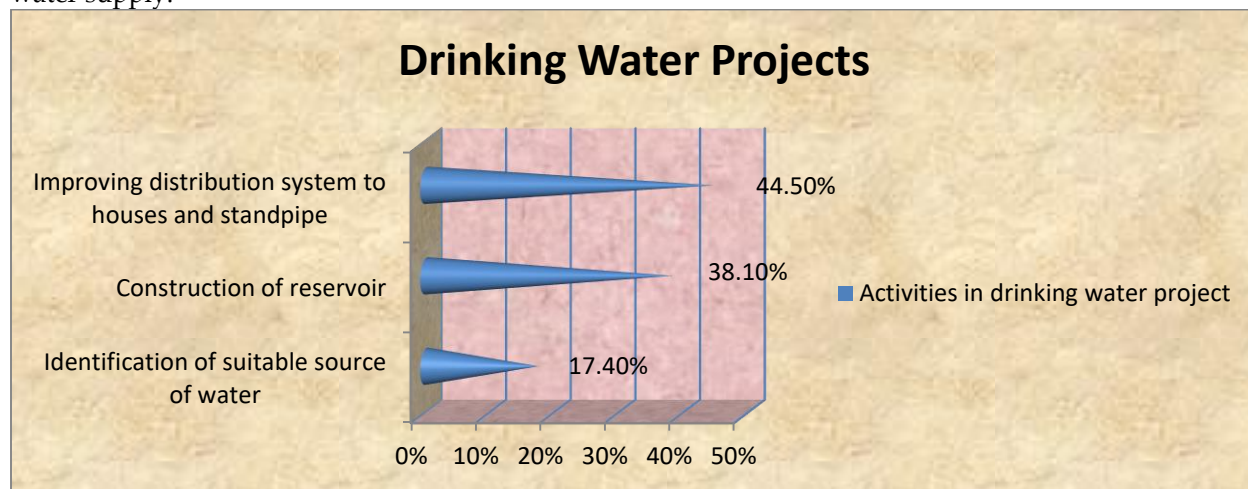


Figure 1.7: Drinking Water Projects

Source: Researcher, 2017

As shown in the figure above, there were several drinking water projects. 159 (44.5%) of the respondents said that improving the distribution system to houses and standpipe and construction of a reservoir 136 (38.1%) were the most noticeable activities. A few respondents however said that identification of suitable source of water was a priority activity. In their findings, Charumitra *et al.*, (2014) argue that to increase access to reliable, affordable, and sustainable water supply and sanitation services to the low-income areas, utilities need to undertake network intensification activities such as expansion of piped water supply and sewerage network through the extension of primary and secondary distribution pipes. This should be done through a balanced program including the involvement of community's indecision making and planning. Communities should be consulted before project implementation in order to ensure ownership. Many community members, such as youth groups take part in the construction of the water and sewer networks. This gives job opportunities for the community and leverages community support for the projects. This was clarified by one participant who said

"The county government through ELDOWAS brought piped water on specific mainline and water Kiosk in the IS which allowed us to easily get meter water at low cost." FGD, (2017) Munyaka 11th March 2017.

Well maintained water projects, enables residents access clean water and as a result, residents especially women can save time and be able to engage in other meaningful economic activities. There is no doubt that availability of clean water supply has less incidences of waterborne diseases and in turn lead to improved health.

The implication of these findings show that green practices were integrated in drinking water projects in the sense that improved distribution increased affordability, access, and availability of water. This ultimately contributed to better time management. Additionally, construction of water reservoir was aimed at arresting water wastage, and water shortage.

Storm Water Drainage Upgrading

Insufficient drainage, often causing floods is considered as a major problem in the informal settlements.

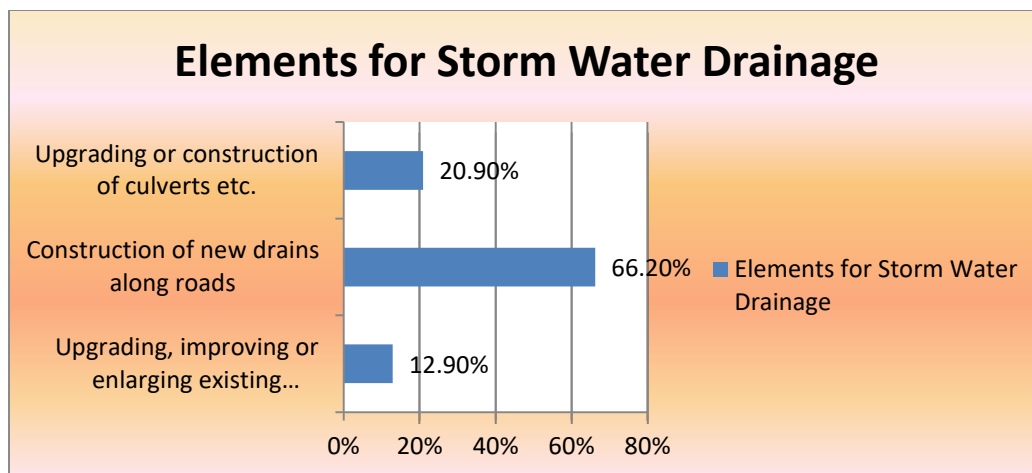


Figure 1.7: Elements for Storm Water Drainage in Upgrading

Source: Researcher, 2017

When respondents were asked to state the elements for storm water drainage in upgrading, 238 (66.2%) of the respondents identified construction of new drainages along the roads, 46 (12.9%) identified upgrading, improving or enlarging existing drainage channels and 79 (20.9%) said that upgrading or construction of culverts. The implications of the findings is that prior to upgrading project of storm water drainage, the IS had inadequate system and that is why construction of new drainage system was

rated highly. The study further established that existing drainages were improved and enlarged due to the normal problem of blockage normally experienced in the informal settlement. In addition, upgrading and construction of culverts was also done in the informal settlements.

Rating the Storm Water Drainage System

The respondents were also asked to rate storm water drainage system in their settlements. The results were represented in the figure below.

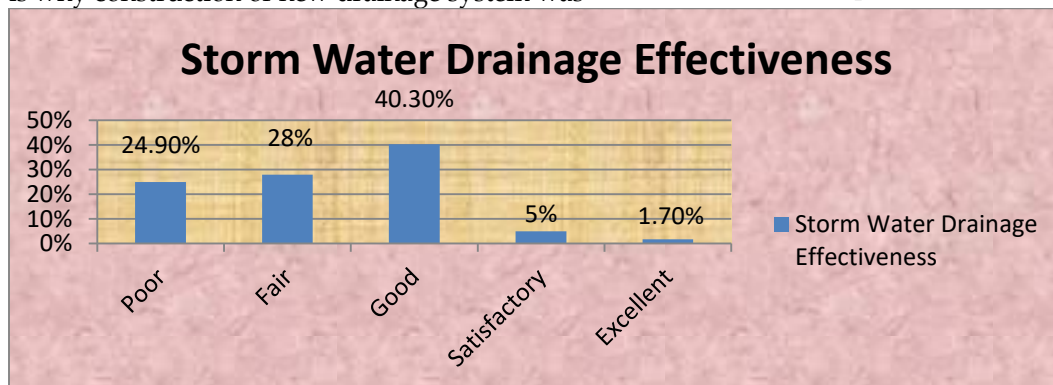


Figure 1.8: Storm Water Drainage Effectiveness

Source: Researcher, 2017

The findings from the study show that 18 (5%) rated the effectiveness of storm water as satisfactory, 6 (1.7%) rated it as excellent, most 144 (40.3%) of the respondents rated the

effectiveness of storm water drainage as good and 100 (28%) of respondents rated the drainage system as Fair. A small percentage rated it as poor. It can therefore be concluded that storm

water drainage was effective. Sadly, residents have not taken any personal initiative to clean the drainage long after its improvement. Further through, FGDs it was established that construction of culverts was not properly done

at Kamukunji. This might contribute to blocking and eventually flood especially during rainy seasons. The pictures below show poorly constructed drainage system.

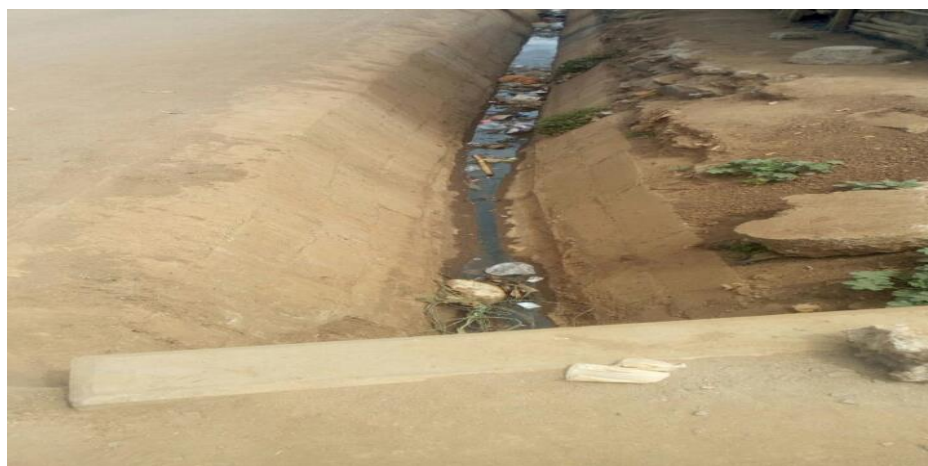


Figure 1.9 Storm Water Drainage in Kamukunji

Source: Field Survey, 2017

Maintenance of Storm Water Drainage

The residents were asked how often the storm water drainage systems were maintained. The results are tabulated below.

Table 4.2: Maintenance of Storm Water Drainage

Rate	Frequency	Percentage (%)
Often	98	27.5%
Once a month	73	20.4%
Once in three months	44	12.4%
Rarely	130	36.4%
Other	12	3.4%
Total	357	100%

Source: Researcher, 2017

When asked about maintenance of storm water drainage, 98 (27.5%) said that they were maintained often, 73 (20.4%) said once a month, 44 (12.4%) said once in three months, majority of the respondents 130 (36.4%) said that maintenance was rarely done. Lastly, 12 (3.4%) could not clearly identify how often the maintenance was done. When were asked to state the problems associated with poor storm water

drainage, 72 (21.5%) respondents could not clearly identify the problem, 182 (50.8%) said waterborne diseases and flooding and another 96 (26.8%) respondents said it led to destruction of housing and property. Half of the participants rated waterborne and flooding as key problem in the IS followed by destruction of housing and property.



Figure 1.10 Maintained drainage in Munyaka

Source: Field Survey, 2017

4. Problems of Poor Storm Drainage

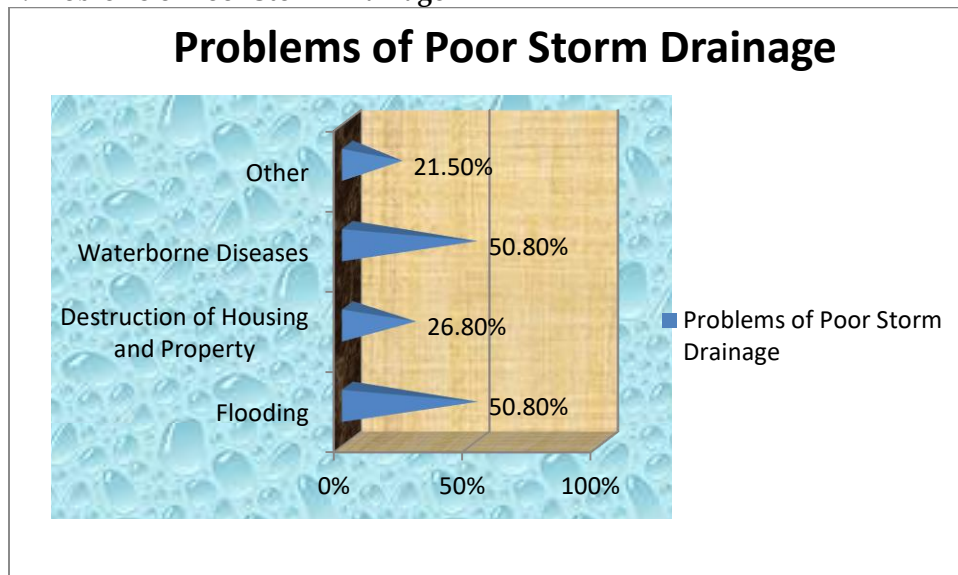


Figure 1.11: Problems of Poor Storm Water Drainage

Source: Researcher, 2017

Presence of Sewerage System

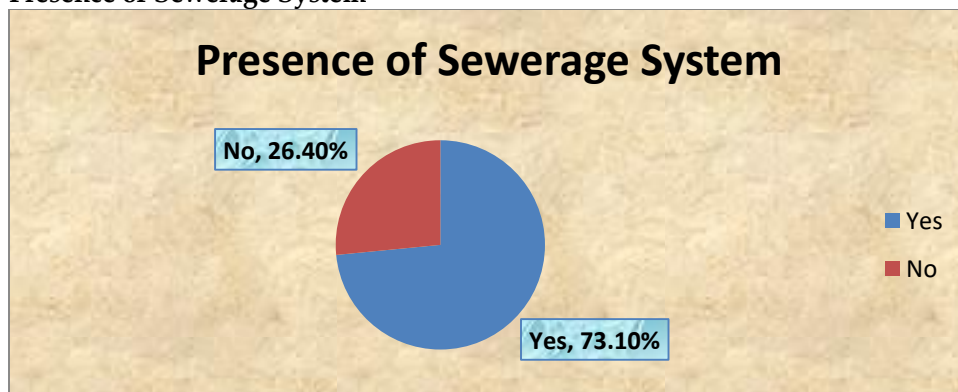


Figure 1.12: Presence of Sewerage System

Source: Researcher, 2017

When the respondents were asked if there was a sewerage system in their settlement, 261 (73.1%) said Yes and 96 (26.9%) said No. This implies that there was sewerage system in the IS but it is not available in some parts of the informal settlements.

Type of Sewerage System

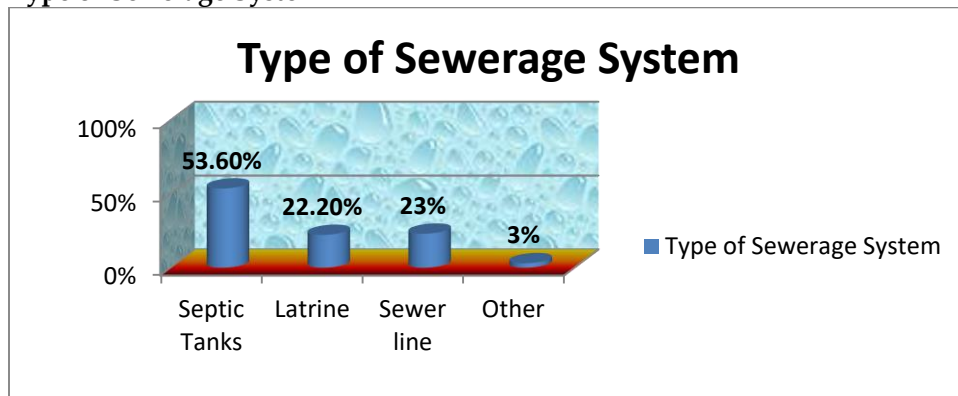


Figure 1.13: Type of Sewerage System

Source: Researcher, 2017

The researcher sought to find out what type of sewerage system was present in the settlement. The respondents' answers are presented as showed above. Most settlements had Septic Tanks 140 (53.6%), next were Latrines with 58 (22.2%) respondents, Sewer line with 60 (23%) and the 3 (1.2%) respondents from the population indicated that they used other means to dispose their sewage waste.

The respondents were asked to identify the elements of upgrading in the sewerage systems and according to the findings, Sewage channels or ducts was identified by 199 (55.7%) respondents, Trunk sewage channel or duct leading to a water treatment plant by 47 (13.3%) respondents and the remaining respondents cited that there was provision of alternative sanitation infrastructure such as communal ablution blocks as identified by 110 (31%) respondents.

Element of Upgrading in Sewerage System

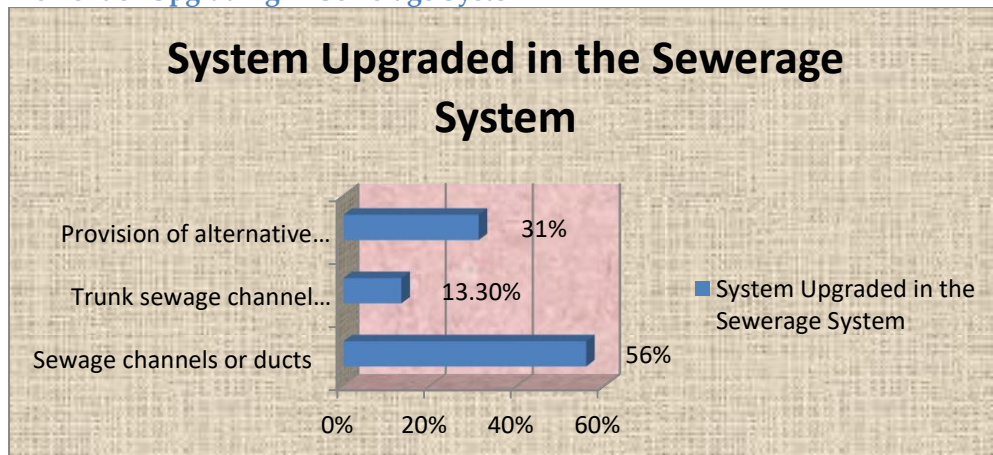


Figure 1.14: System upgraded in the Sewerage System

Source: Researcher, 2017



Figure 1.15 Ablution Block at Huruma

Sustainability of Projects

According to Imparato and Ruster (2003) sustainability may take two major dimensions: continuity of the development process after the project completion and conservation of the benefits derived from the project after completion. Projects will develop their full benefits only if they remain fully operational in the long term. Maintenance of projects is

therefore essential in order to make them sustainable. Maintenance mainly requires two things, namely (i) availability of staff capable of carrying out all surveillance and work required for guaranteeing full functionality of the systems, and (ii) availability of sufficient funding for carrying out any maintenance or repair work which might be required.



Figure 1.16 Sustainability of Green Practices

Source: Researcher, 2017

When the respondents were asked if the initiated green practices were sustainable, 332 (93%) said

yes while 25 (7%) said no. The implication of the above findings is that majority felt that the

upgraded projects will be sustainable. Therefore, sustainability is the most adequate measure of the final success of a project. A sustainable project permanently augments a community's resources and reduces its vulnerability (Imparato and Ruster, 2003). If the IS dwellers will accept such projects upgraded as their own, it means they will do anything possible to maintain such projects

Discussions

Conclusion

The study sought to examine integration of green practices in upgrading of informal settlements medium size town in Kenya by establishing the green practices being employed in upgrading of informal settlements ,evaluating the integration process, assessing the impact of green practices in sustainable informal settlements upgrading and determining the factors influencing integration of green practices in informal settlements upgrading.

IS upgrading is carried out by various stakeholders however the participation of residents in upgrading is relatively low. There are different activities carried out in upgrading the settlement. These include; construction of water distribution system to houses and or stand pipe, construction of new drainage systems, enlarging existing drainage system, construction of sewage channels and provision of alternative sanitation infrastructure. When residents are involved in upgrading their own community, it gives them greater satisfaction, in the sense that it enables them to take their own decisions and be responsible for those decisions. This recognition and identity elevates the community dwellers to a higher level.

The relevance of the present research to the body of knowledge on the sustainability in Kenya is

buttressed by the fact that it has bridged the knowledge gap on how to attain sustainability through eco-friendly activities within the urban context in Kenya. This research has gone beyond the conventional area of studies on squatter settlements and IS, which have been limited to identifying the problems posed by such settlements and finding solutions to them. The solutions which were mostly top-down in their approaches were geared towards upgrading projects addressing basic issues like water, electricity, and waste.

In Conclusion, in the view of these findings, the study concludes that there was low integration of green practices in upgrading process based on what the individual residents had done and on the different projects carried out by the various stakeholders. Many residents, due to low income cannot afford to switch to green practice. Various stakeholders have not fully integrated green practices during upgrading. There should be clear policy and effort to maintain upgraded projects with a keen eye on sustainability so that the environment may be well safe.

Recommendations

The study therefore came up with the following recommendations.

(a) That to be effective and to fully integrate green practices all stakeholders should be involved. Instead of wholly depending on development actors the IS residents should also embrace green practices at individual level

(e) For sustainability to be achieved the local community should be empowered so that they can fully understand their roles as citizens and fully participate in monitoring and evaluations of community projects.

References

Acioly C. (2002). The rationale of informal settlements regularisation projects: from Settlement upgrading to integration approaches. Lecture notes. Institute for Housing and Urban Development Studies - IHS;

- Africa Development Bank (AfBD) Report (2012). *Towards Green growth in Africa*. African Development Bank Group.
- Bouddha C., Dhote K. K. and Sharma A., (2014). Slum redevelopment strategy: a way forward to urban environment Management through inclusive approach. *Research Journal of Engineering Sciences*, vol. 3(7), 28-37, July.
- Chege, E.K, (2013). Challenges of Slum Upgrading for Urban Informal Settlements; Case of Soweto East Village in Kibera Informal Settlements, City of Nairobi.
- Cronin, V. L. M. (2012). Slum upgrading in India and Kenya: investigating the sustainability (Doctoral thesis).
- Going green sustainable living resource guide 2008-2015 middle town Thrall library
- Government of Kenya (2006) *Kenya Slum Upgrading Programme (KENSUP)*. Implementation Strategy 2005 – 2020. Nairobi: Government Printer
- Green Times, n.d., accessed July 15, 2013, <http://www.greentimes.com.au/greentimes/green-Business-definition.html>
- HABITAT (2003). The Challenge of Slums. Global Report on Human Settlements 2003. 310 p. *United Nations Human Settlements Programme*. Earthscan Publications Ltd., London and Sterling.
- Hadi, S. (2015). Promoting sustainable human settlements in Indonesia (<http://pu.go.id/>)
- Imparato, I. & Ruster, J. (2003) Slum Upgrading and Participation – Lessons from Latin America. The International Bank for Reconstruction and Development/ The World Bank, Washington D.C. [Online], Available: <http://www.schwimmer.ca/francesca/slum%20upgrading.pdf> [2014-04-25].
- Kibwana, K. (2000a). Land Tenure, Spontaneous Settlement and Environmental Management in Kenya. In: Wanjala, S.C. (ed.), *Essays on Land Law. The Reform Debate in Kenya*. Faculty of Law, University of Nairobi.
- Krieger, A., Kelbaugh, D. (2009). *Three Urbanisms and the Public Realm: Urban Design and the Pragmatic Turn*. Cambridge University Press. ISBN 978-0745649085
- Mgele, V. O. (2013). Evaluation of Slum upgrading and redevelopment in promoting Sustainable urban human Settlements: A Case Study of Pumwani-Majengo Housing Project, Nairobi County: Thesis.
- Mwangi N. P., Otiego L. and Ndakorerwa C. (2015). Innovation in scaling up access to water and sanitation services in Kenya. Briefing note to support innovation in scaling up access of water and sanitation services urban low income areas. Water and Sanitation Program: REPORT.
- Otiso, K. (2003). State, Voluntary and Private Sector Partnerships for Slum Upgrading and Basic Service Delivery in Nairobi City, Kenya. *Cities* 20 (4), 221-229.
- Perten, (2011). "The Successes and Shortcomings of Participatory Slum-Upgrading in Villa 31" Independent study project (ISP) Collection Paper 1037. (Online) Available at: http://digitalcollections.sit.edu/isp_collection/1037. (Assessed on: 19th May, 2013)
- SDN. (2009). *The Struggle for Integrated Sustainable Settlements*. Retrieved from <http://www.sustainabledevelopmentnetwork.com/manual1/INTEGRATED%20SUSTAINABLE%20SETTLEMENTS.pdf>
- UN Habitat (2003a). *Handbook on Best Practices: Security of Tenure and Access to Land--Implementation of the Habitat Agenda*, UN-Habitat, Nairobi.
- UNCHS (Habitat) (2001a). *Cities in a Globalizing World: Global Report on Human Settlements*. UNCHS (Habitat)/Earthscan, London.

- UNCHS (Habitat) (2001b). *Implementing the Habitat Agenda. The 1996–2001 Experience.* UNCHS (Habitat), Nairobi
- UN-Habitat (2007). Sustainable Urbanization: Local Action for Urban Poverty Reduction, Emphasis on Finance and Planning', in Twenty First Session of the Governing Council. UN-Habitat, Nairobi, Kenya, 16 - 20 April, 2007
- UN-Habitat (2012). *State of the World's Cities, 2012/2013. Nairobi, Kenya.*
- United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP), Asian Development Bank (ADB), United Nations Environmental Program (UNEP) (2010). Green Growth, Resources and Resilience: Environmental sustainability in Asia and the Pacific. UN-ESCAP, Bangkok, Available at [http://www.unescap.org/esd/environment/flagpubs/ggrap/documents/Green%20Growth-16Sept%20\(Final\).pdf](http://www.unescap.org/esd/environment/flagpubs/ggrap/documents/Green%20Growth-16Sept%20(Final).pdf) (Accessed 20 May 2013).
- United Nations Environment Programme UNEP, (2011), Buildings: Investing in energy and resource efficiency, p. 336, UNEP: online release. www.unep.org/greenconomy/Portals/88/documents/ger/GER_12_Cities.pdf retrieved
- World Commission on Environment and Development (WCED). *Our common future.* Oxford: Oxford University Press, 1987 p. 43